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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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JOHN P. O'BANION
O'BANION & RITCHEY LLP
400 CAPITOL MALL SUITE 1550
SACRAMENTO, CA 95814

EXAMINER	
SUNG, CHRISTINE	

ART UNIT	PAPER NUMBER
2884	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/039,290	SHAKOURI ET AL.	
	Examiner	Art Unit	
	Christine Sung	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31 and 40-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31 and 40-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date ____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

1. The amendment filed on December 7, 2005 has been accepted and entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

3. Claims 1, 3-10, 13-15, 17, 19, 24, 30-31 and 40-44 are rejected under 35 U.S.C. 102(e) as being anticipated by Taketoshi et al. (JP Publication 2000-121585).

Regarding claim 1, Taketoshi discloses an apparatus for providing non-contact thermal measurements at high spatial and thermal resolutions, comprising:

An illumination source (Figure 2, element 9);

Means for generating an electrical signal in response to registration of the magnitude of light received from said illumination source (or detector, element 14 or 17) that is reflected (see figure 2) from the surface of the object (element 3);

Said means for generating a signal comprising an illumination detector (element 14 or 17);

Means for subjecting said object to modulated (element 8, modulator) thermal excitation (thermal source or heating source, element 7);

Means for generating a bandwidth limited (figure 2, element 15) AC- Component (paragraph [0028]) of the signal from the illumination detector in response to changes in

thermoreflectivity from said surface of said object arising while said object is subjected to said modulated thermal excitation (abstract).

Regarding claim 3, Taketoshi discloses that the means for generating an electrical signal in response to registration of the magnitude of light received from said illumination source that is reflected from the surface of the object is an array of individual illumination detectors (or a CCD, paragraph [0030]).

Regarding claim 4, Taketoshi discloses that the array of illumination detectors generates information on the intensity of light received by each of the individual illumination detectors in the array (this is an inherent property of CCDs, further Taketoshi discloses measuring the reflectance of the laser (abstract) or intensity of the light).

Regarding claim 5, Taketoshi discloses measuring the AC component of the signal (see above) and further discloses a display (element 18) for displaying the signal.

Regarding claims 6 and 7, Taketoshi discloses a means for receiving a bandwidth limited AC-component signal (paragraph [0028]) associated with the known frequency of thermal measurement on thermo reflectivity changes of said object (abstract).

Regarding claim 8, Taketoshi discloses a means for generating a combination of thermal images (paragraph [0031]).

Regarding claim 9, Taketoshi discloses a computer (element 18);

And programming associated with the computer for receiving a plurality of imagines and combining the images (paragraph [0031]).

Regarding claim 10, Taketoshi discloses that the illumination source is a laser light source (see claim 1).

Regarding claims 11, Taketoshi discloses that the illumination source is a HeNe laser (paragraph [0028]). HeNe lasers, by definition usually operate at a wavelength of 632 nm (see attached Wikipedia definition).

Regarding claims 13-14, Taketoshi discloses that the illumination source is a HeNe laser (paragraph [0028]). HeNe lasers, by definition, have an output power ranging from 1mW-100 mW (see attached Wikipedia definition).

Regarding claim 15, Taketoshi discloses and x-y translation stage (figure 2, element 1 and 2);

Said translation stage configured to provide motion to said illumination source (element 9)and said illumination detector (elements 14 and 17) in relation to the surface of the object (element 3);

Wherein a thermal image may be constructed from data collected during the scanning of the object (paragraph [0029]).

Regarding claim 17, Taketoshi disclose that the illumination source is configure to generate a beam spot size that approximates or is less than, the desired spatial resolution of thermal measurement (See "problem to be solved" section).

Regarding claim 19, Taketoshi discloses that the illumination detector is a photodiode (paragraph [0029]).

Regarding claim 24, Taketoshi discloses that the signal processor is a lock in amplifier (element 19).

Regarding claim 30, Taketoshi discloses an imaging device (elements 14 ad 17) adapted to receive a potion of the reflected illumination for aligning position of the illumination source in relation to the object (paragraph [0030]).

Regarding claim 31, Taketoshi discloses a splitter (element 13) configured to direct portions of said reflect illumination to said imaging device (elements 14 and 17).

Regarding claim 40, Taketoshi discloses a method for providing high resolution thermal imaging of an object being subjected to thermal modulation at a known frequency range (sine frequency), comprising:

Illuminating (Figure 2, element 9) an area on the surface of an object (element 3) for which thermal information is desired;

Detecting illumination reflected from said area (elements 14 and 17); and

Generating an AC-coupled bandwidth limited signal (paragraph [0028]) in response to detected illumination associated with the known frequency of thermal modulation and thermo reflectivity changes of said object (abstract).

Regarding claim 41, Taketoshi discloses that the AC coupled signal has a bandwidth with a center at, or associated with, the frequency of modulation to which said object is subjected (element 8, modulator).

Regarding claim 42, Taketoshi discloses resolving the AC coupled signal into an image (paragraph [0030]).

Regarding claim 43, Taketoshi discloses a method for providing high resolution thermal imaging of a object being subjected to thermal modulation at a known frequency range, comprising:

Illuminating (figure 2, element 9) an area on the surface of an object (element 3) for which thermal information is desired;

Detecting illumination (elements 14 and 17) reflected from said area in response to changes in thermo reflectance of the surface as subjected to thermal modulation (abstract);

Generating an AC coupled bandwidth limited signal (paragraph [0028]) in response to detected illumination within the known frequency range (abstract); and

Resolving the AC coupled signal into an image (paragraph [0030]).

Regarding claim 44, Taketoshi discloses that AC coupled signal has a bandwidth with a center at or associated with the frequency of thermal modulation to which the object is subjected (element 8, modulator).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 2, 12, 16, 20-23, 25-26, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taketoshi et al. (JP Publication 2000-121585).

Regarding claim 2, Taketoshi discloses an apparatus for providing non-contact thermal measurements t high spatial and thermal resolutions, comprising:

An illumination source (Figure 2, element 9);

An array of individual illumination detectors (elements 14 and 17);

Said illumination detectors configured to generate an electrical signal in response to registration of the magnitude of light received from said illumination source (or detector, element 14 or 17) that is reflected (see figure 2) from the surface of the object (element 3);

A circuit for modulating the thermal excitation of said object at a known frequency (sine frequency); and

Taketoshi does not explicitly disclose a signal processor configured to filter one or more direct current components from said signal while said object is subjected to modulated thermal excitation to discern a thermo reflectance signal associated with said known frequency, from noise. However, Taketoshi does disclose that he only wants an AC- component as evidenced by the AC-source (see above). One of ordinary skill in the art would be motivated to filter the DC components in order to reduce the noise in the detected radiation.

Regarding claim 12, Taketoshi discloses the limitations set forth in claim 10 but does not explicitly specify a 655 nm source. However, HeNe laser sources come in various wavelengths (see attached Wikipedia definition). One of ordinary skill in the art would be motivated to use a

655 nm source as it is a result effective variable, dependent upon the optimum operating source for the desired sample.

Regarding claim 16,Taketoshi discloses an x-y translational stage (Figure 2, elements 1 and 2) and further disclose that the translation stage provides movement resolution that is approximately equal to or higher than the desired spatial resolution at which the object is being measured. (see "problem to be solved"). Taketoshi does not explicitly state that the translation stage is a piezoelectric stage, however, one of ordinary skill in the art would be motivated to use such a conventional stage in order to reduce power consumption of the apparatus.

Regarding claims 20-21, Taketoshi discloses that the illumination detector is a CCD array (paragraph 0029), it does not explicitly specify the array size, however, ranges such as 16x16 - 64x64, and 2x2-256x256 are commonly used sizes. One ordinary skill in the art would be motivated to select the size of the detector as claimed dependent upon the efficiency and amount of processing desired for an image. (i.e. the smaller the array, there is less processing, but reduced accuracy, and the larger the array, the more processing but increase accuracy).

Regarding claims 22 and 27-29, Taketoshi discloses that the thermal excitation is modulated at a sine frequency which can be tuned to a desired frequency. It would have been obvious to one having ordinary skill in the art at the time the invention was made to tune the modulated thermal excitation at the claimed frequency, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 220 F 2d 454. 105 USPQ 233, 235 (CCPA 1955).

Regarding claim 23, Taketoshi discloses a bandpass filter associated with the thermal excitation (element 15), but Taketoshi does not explicitly disclose a signal processor configured to filter one or more direct current components from said signal while said object is subjected to modulated thermal excitation to discern a thermo reflectance signal associated with said known frequency, from noise. However, Taketoshi does disclose that he only wants an AC- component as evidenced by the AC-source (see above). One of ordinary skill in the art would be motivated to filter the DC components in order to reduce the noise in the detected radiation.

Regarding claims 25-26, Taketoshi discloses that the sine signal (harmonic signal)is detected (paragraph [0006]), but does not explicitly specify filtering components. However, Taketoshi does disclose that he only wants an AC- component as evidenced by the AC-source (see above). One of ordinary skill in the art would be motivated to filter those signals that are not associated with the sine modulated signal in order to increase the accuracy of the detected radiation.

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taketoshi et al. (JP Publication 2000-121585) in view of Dentinger (US Patent 6,166,384 A)

Regarding claim 18, Taketoshi discloses the limitation set forth in claim 17, but does not specify an inverse filter for removing image blurring caused by an excessively large illumination spot. However, Dentinger discloses a conventional imager that uses an inverse filter to remove image blurring (column 3, line 56- column 4, line 5). One of ordinary skill in the art would be motivated to use the inverse filter as disclosed by Taketoshi in order to decrease image blurring.

Response to Arguments

8. Applicant's arguments filed December 7, 2005 have been fully considered but they are not persuasive.

9. Applicant's arguments with respect to claims 1-31 and 40-44 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Sung whose telephone number is 571-272-2448. The examiner can normally be reached on Monday- Friday 7-3 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christine Sung
Examiner
Art Unit 2884

OTILIA GABOR
PRIMARY EXAMINER

CS